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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/675,885	09/29/2003	Martin Heugel	59958 (70301)	6825

21874 7590 01/11/2007

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EXAMINER	
EWALD, MARIA VERONICA	
ART UNIT	**PAPER NUMBER**
1722	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/11/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/675,885	HEUGEL, MARTIN	
	Examiner	Art Unit	
	Maria Veronica D. Ewald	1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 October 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *12-24* is/are pending in the application.

4a) Of the above claim(s) *16-24* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *12-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 May 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/22/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

13. The disclosure is objected to because of the following informalities: Lines 1 and 2 of the Specification state: "The present invention refers to a device and a method for the manufacture of three-dimensional objects according to the preamble of Patent Claim 1 or Patent Claim 4." However, claims 1 and 4 have both been cancelled in the instant application. Appropriate correction or deletion of such a reference in the specification is required.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 12 – 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mattes, et al. (U.S. 5,876,767) in view of Friesem, et al. (U.S. 6,850,544). Mattes, et al. teach a device for the layer-by-layer manufacture of a three-dimensional object by means of selective hardening at those sites of a layer of a building material that correspond to the cross-section of the object through the use of a laser (column 1, lines 58 – 60), the device comprising: a laser that provides radiation (item 5 – figure 1; column 2, lines 5 – 6); and a focusing unit that focuses the radiation to provide a

focused beam (item 8 – figure 1; column 2, lines 7 – 8). However, Mattes, et al. do not teach that there is a beam expansion element or a switching element for changing the modal composition of the laser radiation which changes the modal composition of the laser radiation between a first setting in which a fundamental Gauss mode is emitted and higher order modes are suppressed and a second setting in which the radiation contains additional higher order modes and the overall power of the radiation is increased.

In a method to control the mode settings of a multimode laser, Friesem, et al. teach the use of an optical resonator and mode control elements (i.e, apertures and phase elements). Typical high-power lasers with large apertures have multimode patterns. The multimode pattern results in a beam of relatively low brightness and thus, such low brightness limits the usage of the laser in industrial processes where a small, well-defined focused spot or well collimated beam is necessary (column 1, lines 25 – 30). Typically, the fundamental or Gauss mode is used which possesses the highest brightness of all possible modes; however, this mode does not fill the entire gain medium diameter and thus, there exists a need to obtain different modes other than the Gauss mode, which will result in a large lasing volume (column 1, lines 45 – 55).

Friesem, et al., thus, teach the use of a mode control element in which a single mode or a set of modes can be utilized, depending on the user's needs (column 3, lines 45 – 50, 60 – 67). Thus, either a well-defined beam can be produced or when a set of modes is used, a high utilization of the gain medium diameter is achieved (column 4, lines 5 – 10). This reads on the Applicant's claims that the laser comprises a switching

element which changes the modal composition of the laser between a first setting in which only the Gauss mode is emitted and a second setting in which the radiation contains additional higher modes and the overall power of the radiation is increased and further reads on the claims that there is a beam expansion element and at least one mode aperture.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the Applicant's invention to include with the device of Mattes the switching or mode control element of Friesem, et al. for the purpose of being able to control and switch a multimode laser beam such that a well-defined controlled phase in which the Gauss mode is utilized to selectively harden a single spot and subsequently go to another mode in which a set of modes is used to thereby increase radiation power and obtain a high level of utilization of the gain medium diameter, as taught by Friesem, et al.

Claims 12 – 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith (U.S. 6,391,245) in view of Friesem, et al. Smith teaches a device for the layer-by-layer manufacture of a three-dimensional object by means of selective hardening at those sites of a layer of a building material that correspond to the cross-section of the object through the use of a laser (column 5, lines 50 – 55), the device comprising: a laser that provides radiation (column 3, lines 60 – 65); and a focusing unit that focuses the radiation to provide a focused beam (column 4, lines 1 – 5; column 6, lines 34 – 35). However, Smith does not teach that there is a beam expansion element or a switching element for changing the modal composition of the laser radiation which changes the

modal composition of the laser radiation between a first setting in which a fundamental Gauss mode is emitted and higher order modes are suppressed and a second setting in which the radiation contains additional higher order modes and the overall power of the radiation is increased.

In a method to control the mode settings of a multimode laser, Friesem, et al. teach the use of an optical resonator and mode control elements (i.e, apertures and phase elements). Typical high-power lasers with large apertures have multimode patterns. The multimode pattern results in a beam of relatively low brightness and thus, such low brightness limits the usage of the laser in industrial processes where a small, well-defined focused spot or well collimated beam is necessary (column 1, lines 25 – 30). Typically, the fundamental or Gauss mode is used which possesses the highest brightness of all possible modes; however, this mode does not fill the entire gain medium diameter and thus, there exists a need to obtain different modes other than the Gauss mode, which will result in a large lasing volume (column 1, lines 45 – 55).

Friesem, et al.; thus, teach the use of a mode control element in which a single mode or a set of modes can be utilized, depending on the user's needs (column 3, lines 45 – 50, 60 – 67). Thus, either a well-defined beam can be produced or when a set of modes is used, a high utilization of the gain medium diameter is achieved (column 4, lines 5 – 10). This reads on the Applicant's claims that the laser comprises a switching element which changes the modal composition of the laser between a first setting in which only the Gauss mode is emitted and a second setting in which the radiation contains additional higher modes and the overall power of the radiation is increased and

further reads on the claims that there is a beam expansion element and at least one mode aperture.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the Applicant's invention to include with the device of Smith the switching or mode control element of Friesem, et al. for the purpose of being able to control and switch a multimode laser beam such that a well-defined controlled phase in which the Gauss mode is utilized to selectively harden a single spot and subsequently go to another mode in which a set of modes is used to thereby increase radiation power and obtain a high level of utilization of the gain medium diameter, as taught by Friesem, et al.

Claims 12 – 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano, et al. (EP 0406513 A1) in view of Friesem, et al. Hirano, et al. teach a device for the layer-by-layer manufacture of a three-dimensional object by means of selective hardening at those sites of a layer of a building material that correspond to the cross-section of the object through the use of a laser, the device comprising: a laser that provides radiation (column 3, lines 48 – 51); and a focusing unit that focuses the radiation to provide a focused beam (column 3, lines 45 – 55); however, Hirano, et al. do not teach the use of a switching element to change the modal composition of the laser. Hirano, et al., however, also teach that the optical system or laser is equipped, with two light emitting heads (items 33 and 33 – figure 8) – one light emitting head with a small diameter focusing on detailed parts of the surface portion of the object being

cured and a second light emitting head with a large diameter focusing on the main part to schematically cure the main part (column 2, lines 45 – 55).

In a method to control the mode settings of a multimode laser, Friesem, et al. teach the use of an optical resonator and mode control elements (i.e, apertures and phase elements). Typical high-power lasers with large apertures have multimode patterns. The multimode pattern results in a beam of relatively low brightness and thus, such low brightness limits the usage of the laser in industrial processes where a small, well-defined focused spot or well collimated beam is necessary (column 1, lines 25 – 30). Typically, the fundamental or Gauss mode is used which possesses the highest brightness of all possible modes; however, this mode does not fill the entire gain medium diameter and thus, there exists a need to obtain different modes other than the Gauss mode, which will result in a large lasing volume (column 1, lines 45 – 55).

Friesem, et al., thus, teach the use of a mode control element in which a single mode or a set of modes can be utilized, depending on the user's needs (column 3, lines 45 – 50, 60 – 67). Thus, either a well-defined beam can be produced or when a set of modes is used, a high utilization of the gain medium diameter is achieved (column 4, lines 5 – 10). This reads on the Applicant's claims that the laser comprises a switching element which changes the modal composition of the laser between a first setting in which only the Gauss mode is emitted and a second setting in which the radiation contains additional higher modes and the overall power of the radiation is increased and further reads on the claims that there is a beam expansion element and at least one mode aperture.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the Applicant's invention to include with the device of Hirano, et al. the switching or mode control element of Friesem, et al. for the purpose of being able to control and switch a multimode laser beam such that a well-defined controlled phase in which the Gauss mode is utilized to selectively harden a single spot and subsequently go to another mode in which a set of modes is used to thereby increase radiation power and obtain a high level of utilization of the gain medium diameter, as taught by Friesem, et al.

Response to Arguments

15. Applicant's arguments, see pages 5 – 6, filed October 24, 2006, with respect to the rejection(s) of claim(s) 12 – 15 under 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Mattes, Smith or Hirano, et al. in view of Friesem, et al.

Applicant argued that the previously-cited reference of Borstel did not teach a switching element in which a second setting emitted additional higher modes of radiation. Examiner agrees and thus, in light of newly-amended claim 12, has cited the reference of Friesem, et al. Friesem, et al. teach a multimode laser with a mode control or switching element in which either a single mode can be set or a group of modes can be set, thus, producing a well-defined laser beam or a high-powered laser beam which utilizes a high level of the gain medium diameter.

Conclusion

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Veronica D. Ewald whose telephone number is 571-272-8519. The examiner can normally be reached on M-F, 8 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Yogendra Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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